

(PCT Article 36 and Rule 70)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/012438

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rule 12.3 and 23.1(b))
- ☐ publication of the international application (Rule 12.4)
- ☐ international preliminary examination (Rule 55.2 and/or 55.3)
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-11 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- nos. _____ as originally filed/furnished
- nos.* _____ as amended (together with any statement) under Article 19
- nos.* 1-22 _____ received by this Authority on /filed with the demand
- nos.* _____ received by this Authority on _____
- ☒ the drawings:
- sheets 1/3-3/3 _____ as originally filed/furnished
- sheets* _____ received by this Authority on _____
- sheets* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☒ the claims, nos. 23-25 _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____
4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☒ the claims, nos. 1-12, 21, 22 _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/012438

Box No. IV

Lack of unity of invention

1. ☐ In response to the invitation to restrict or pay additional fees the applicant has:
- ☐ restricted the claims.
 - ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ neither restricted the claims nor paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is:
- ☐ complied with.
 - ☐ not complied with for the following reasons:
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☐ the parts relating to claims Nos. _____

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/012438

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1.	Statement		
	Novelty (N)	Claims <u>1-22</u>	YES
		Claims _____	NO
	Inventive step (IS)	Claims _____	YES
		Claims <u>1-22</u>	NO
	Industrial applicability (IA)	Claims <u>1-22</u>	YES
		Claims _____	NO
2.	Citations and explanations (Rule 70.7)		
3.	Reference is made to the following documents:		
	<p>D1: US-B1-6 498 355 (HARRAH SHANE ET AL) 24 December 2002 (2002-12-24)</p> <p>D2: WO 02/089221 A (MATSUSHITA ELECTRIC WORKS LTD; SHIOHAMA EIJI (JP); KUZUHARA ITUKOU (J) 7 November 2002 (2002-11-07)</p> <p>D2a: EP-1 398 839 A1 (MATSUSHITA ELECTRIC WORKS LTD) 17 March 2004 (2004-03-17)</p> <p>D3: WO 03/019679 A (MATSUSHITA ELECTRIC WORKS LTD; SHIOHAMA EIJI (JP); SUGIMOTO MASARU (J) 6 March 2003 (2003-03-06)</p>		
4.	The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claims 1, 21 and 22 does not involve an inventive step (PCT Article 33(3)).		
4.1	Document D1 is considered the prior art closest to the subject matter of claims 1, 21 and 22 and discloses (see figures 3 and 4) a light-emitting diode arrangement comprising a light-emitting diode chip (28), a multi-layer board (6-8-10) with		

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/012438

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
	<p>a metal base (6), and an electrically insulating and thermally conductive bonding layer (24) between the emission surface of the light-emitting diode chip and the board, an intermediate carrier (30) being disposed between the light-emitting diode chip and the board.</p> <p>4.2 The subject matter of claim 1 thus differs from the known light-emitting diode arrangement in that the intermediate carrier is formed from an aluminium nitride substrate. It is known in the art, however, to use aluminium nitride substrates as intermediate carriers when good electrically insulating and thermally conductive properties are wished for. The subject matter of claim 1 therefore cannot be considered inventive.</p> <p>4.3 In addition, the use of colour conversion substances disposed above and next to the light-emitting diode chip and the application of the light-emitting diode chip using conductive glue are conventional features (see, e.g., D2, figure 93 in conjunction with D2a, paragraph [0076]; and D2, figure 22 in conjunction with D2a, paragraph [0058]). The subject matter of claims 21 and 22 therefore fails to involve an inventive step.</p> <p>5. Dependent claims 2-20 do not contain any features which, in combination with the features of any claim to which they refer, meet the PCT requirements for inventive step. D1 discloses the</p>

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/012438

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
	<p>additional features of claims 2-4, 11-13, 15-17 and 20; the features of claims 5-10 are disclosed in D3 and those of claims 14 and 18-20 in D2.</p> <p>6. The subject matter of claims 1-22 is industrially applicable and therefore meets the requirements of PCT Article 33(4).</p>

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Boxes I and IV

Box I**Basis of the report**

1. The International Searching Authority is of the opinion that some of the amendments filed with the demand go beyond the disclosure in the international application as filed.
 - 1.1 The original description discloses the use of an intermediate carrier only in conjunction with light-emitting diode chips arranged such that the substrate of the light-emitting diodes faces away from the board ("face down"). Claims 1-12, 21 and 22 therefore go beyond the disclosure of the application, since they claim protection for light-emitting diodes that are mounted differently.
 - 1.2 For the interpretation of claims 1-12, 21 and 22, this report thus assumes that what is concerned are light-emitting diode arrangements in which the substrate of the light-emitting diodes faces away from the board.

Box IV**Lack of unity of invention**

2. The International Searching Authority has determined that this international application

Supplemental Box

contains multiple (groups of) inventions, as follows:

Group 1: claims 1-22

Light-emitting diode arrangement comprising a light-emitting diode chip, a multi-layer board with a base made of a good thermally conductive material, and an electrically insulating and thermally conductive bonding layer between the emission surface of the light-emitting diode chip and the board.

Group 1.1: claims 4-20

Arrangement in which a light-emitting diode chip is accommodated in a hollow in a board.

- 2.1 Independent claims 1 and 4 are linked merely by the concept of applying a light-emitting diode to a board, which is routine practice for a person skilled in the art. The additional features of independent claim 1 solve the problem of heat dissipation, whilst those of claim 4 (when it does not refer back to the preceding claims) are used to planarise the arrangement. The additional, different features of claims 1 and 4 are therefore not equivalent, since they do not solve the same technical problem.